NAVAL POSTGRADUATE SCHOOL
Monterey, California

EC 3210 MIDTERM EXAM I 10/98 Prof. Powers

- This exam is open book and notes.
- There are three problems; each is equally weighted.
- Partial credit will be given; be sure to do some work on each problem.
- Be sure to include units in your answers.
- Please circle or underline your answers.
- Do *NOT* do any work on this sheet.
- Show *ALL* work.
- Enter your name in the space provided.

1	
2	
3	
Total	

Name: _____

1. A laser, operating at 1.06 μm, produces a beam with a diameter of 1 mm at the front of a beam expander. The beam passes through the beam expander and produces an output beam with a diameter of 8 mm and a beam divergence of 0.05 milliradians. Find the beam waist size, w_0, inside the laser.

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2. Consider a scanning Fabry-Perot interferometer consisting of two mirrors (each with power reflectivities of 98%) spaced a distance d apart. The gap is air. Examination of the transmission peak of the interferometer reveals that it has a full-width at the half-maximum points of 100 MHz.

   When one of the mirrors is translated a small distance, it is observed that the transmission peak moves -100 GHz.

   (a) Find the initial mirror separation d.

   (b) Find the mirror translation distance, Δd.

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3. Consider a quarter-waveplate. The fast axis of the waveplate is oriented vertically; the slow axis is oriented horizontally.

   The input wave is elliptically polarized with its major axis at a $+15^\circ$-angle from the horizontal axis. The length of the slow-axis component at the input is twice the length of the fast-axis component.

   The output wave is also elliptically polarized. What angle does its major axis make as measured from the horizontal?